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An update to the taxonomy of some Western Australian genera of Myrtaceae tribe Chamelaucieae. 1. *Calytrix*

Barbara L. Rye

Western Australian Herbarium, Department of Parks and Wildlife,
Locked Bag 104, Bentley Delivery Centre, Western Australia 6983
Email: Barbara.Rye@dpaw.wa.gov.au

Abstract

B.L. Rye. An update to the taxonomy of some Western Australian genera of Myrtaceae tribe Chamelaucieae. 1. *Calytrix*. *Nuytsia* 23: 483–501 (2013). *Calytrix watsonii* (F.Muell. & Tate) C.A.Gardner is reinstated and four species with conservation priority are described: *C. hislopii* Rye, *C. patrickiae* Rye, *C. sagei* Rye and *C. viscida* Rye. Keys are given for the species groups that include these taxa. The current study has eliminated about half of the informal names that have been in use for Western Australian members of the genus. Several species complexes that need further study are noted.

Introduction

Within the large myrtaceous tribe Chamelaucieae DC. there are numerous unnamed species and subspecies awaiting description. Currently about 235 of these taxa are recognised by informal names on *FloraBase* (Western Australian Herbarium 1998–), making up about 30% of the Western Australian members of the tribe. One of the reasons for there being such a large backlog of unnamed taxa is that many of them belong to parts of the tribe in which the generic limits are very uncertain. Among the numerous unnamed taxa whose generic placement is clear, some are considered too poorly known to describe, in most cases because they are known from only one collection, while others cannot be readily described because they belong to difficult species complexes.

This paper is the first in a series aimed at reducing the number of unnamed Western Australian species and subspecies of Chamelaucieae by targeting those that do not fall into any of the problematic categories noted above. Another aim of the series is to highlight areas where further taxonomic work is needed. The current paper deals with new species of *Calytrix* Labill., a large genus that is endemic to Australia and has its maximum concentration in the south-west of Western Australia. *Calytrix* has the widest geographic range of any genus from the tribe Chamelaucieae within Western Australia, and also has the widest distribution in Australia as a whole. Four new species with conservation priority are described, one previously named species is reinstated, and some taxa needing further investigation are noted.

Background

When Bentham (1867) published a treatment of Myrtaceae in *Flora Australiensis* he recognised 34 species of *Calytrix* and eight species of *Lhotskya* Schauer. Some 120 years later, Craven (1987) revised *Calytrix*, reducing *Lhotskya* to a synonym and recognising 72 species, including 53 that were

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known from Western Australia. In Craven's revision the species were placed in six informal groups. Four of the groups had less than ten species apiece but the *C. exstipulata* DC. and *C. variabilis* Lindl. groups were much larger and described as 'largely associations of convenience' (Craven 1987: 17). To give an indication of the relationships within these two large groups, Craven placed about half of their species into four alliances, including the *C. exstipulata* alliance and the *C. flavescens* A.Cunn. alliance. He thought the alliances and the first three small groups (e.g. the *C. decandra* DC. group) were likely to 'represent real associations'.

A few years later, Craven (1990) increased the number of Western Australian species recognised by three. Several species complexes were left incompletely resolved at that stage. One of these, the *C. ecalycata* Craven complex, was revised by Keighery (2004), who named one new species and two new subspecies. Other increases in the number of named species recorded for Western Australia have resulted from the discovery that *C. gypsophylla* Craven extends into Western Australia (previously known only from South Australia), the reapplication of the name *C. watsonii* (F.Muell. & Tate) C.A.Gardner, which is formally reinstated here, and the description of one new species from the Kimberley region (Barrett *et al.* 2009). By 2010, the number of named Western Australian species recognised on *FloraBase* (Western Australian Herbarium 1998–) had therefore risen to 60.

Thirteen informal names are listed on *FloraBase* for Western Australian species or variants of *Calytrix* (Table 1). The first informal name was allocated to a member of the *C. variabilis* alliance shortly before that species was described by Craven (1990) as *C. oncophylla* Craven. Six of the informal names apply to members of the *C. acutifolia* (Lindl.) Craven complex; however, only four are still in use as the current study established that one was a synonym of *C. acutifolia s. str.* and that an informal subspecies name had been accidently created for a taxon that already had an informal name at the species level. The other six informal names apply to varied species groups as indicated in Table 1.

In the current study of *Calytrix*, descriptions were prepared for all of the unnamed taxa to complete the coverage of the genus in an interactive key to the tribe Chamelaucieae (Rye *et al.* 2011–). The two most recent informal names listed in Table 1 were established in 2013 as a result of this work.

Need for further work

There are very few PERTH specimens of *Calytrix* that have not been determined to the species level. One or two of these (e.g. *A.H. Burbidge* 4413) may be the sole representatives of new taxa, but there could be a larger number of new taxa currently housed under species complexes. The need for further collection of two yellow-flowered members of the *C. strigosa* A.Cunn. alliance, each known from a single collection, is discussed below.

The *C. acutifolia* complex needs further work to determine what status should be given to the four informal names (see Table 1) that are still in use for its members. Greg Keighery (pers. comm.) originally recognised six taxa within this complex, intending to treat most of them as subspecies. One variant of the complex already has a published name, *Lhotskya ericoides* Schauer, but a new combination cannot be made to transfer *L. ericoides* to *Calytrix* as the epithet is already in use for the eastern Australian species *C. ericoides* A.Cunn.

The highly variable specimens housed under *C. leschenaultii* (Schauer) Benth. (see Rye 1987: 393) and the pink-flowered members of the *C. strigosa* alliance, including *C.* sp. Paynes Find (F. & J. Hort 1188),

Table 1. Informal names listed on *FloraBase* for the genus *Calytrix* and the year established.

Group	Informal name	Year	Outcome
C. acutifolia complex	*C. acutifolia* subsp. Calingiri (G.J. Keighery 16401)	2010	= *C.* sp. Wheatbelt (R. Davis 4544)
	C. sp. Eneabba (B.J. Lepschi & T.R. Lally BJL3617)	2001	informal name still current
	C. sp. Esperance (M.A. Burgman 4268A)	2001	informal name still current
	C. sp. Scarp (H. Bowler 270)	2001	reduced to a synonym of *C. acutifolia* in 2008
	C. sp. Tutunup (G.J. Keighery& N. Gibson 2953)	2001	informal name still current
	C. sp. Wheatbelt (R. Davis 4544)	2001	informal name still current
C. decandra group	*C.* sp. Jackson Range (G. Cockerton et al. LCH 13786)	2013	published here as *C. viscida*
C. exstipulata alliance	*C.* sp. Sandstone (D.J. Edinger 5498)	2010	published here as *C. hislopii*
C. flavescens alliance	*C.* sp. Jingaring (F. Obbens, R. Davis & L.W. Sage LWS1332)	1999	published here as *C. sagei*
C. simplex alliance	*C.* sp. Dragon Rocks (K. Kershaw & L. Kerrigan KK 2180)	2003	published here as *C. patrickiae*
C. strigosa alliance	*C.* sp. Paynes Find (F. & J. Hort 1188)	2005	informal name still current
	C. sp. Kennedy Range (A. Markey & S. Dillon 6301)	2013	informal name still current
C. variabilis alliance	*C.* sp. Wongamine (S. Patrick 458)	1990	published in 1990 as *C. oncophylla*

are under study by Malcolm Trudgen and Emily Ager. Specimens currently housed as *C. exstipulata* form another difficult complex in northern Australia (see Craven 1990).

Methods

Type specimens of three named members of the *C. strigosa* alliance were borrowed from MEL and images of types housed elsewhere were examined through *Global Plants* (see http://plants.jstor.org/). Holotypes of all newly named species are lodged at PERTH. Morphological measurements were obtained from well pressed, dried material. The distribution maps were compiled using DIVA-GIS Version 5.2.0.2, from data obtained from *FloraBase* (Western Australian Herbarium 1998–). They show the *Interim Biogeographic Regionalisation for Australia* Version 6.1 regions (Department of the Environment, Water, Heritage and the Arts 2008).

Descriptions and keys

The brief description given below covers characters that are either constant in *Calytrix* or present in the great majority of species, so as to avoid repetition in the descriptions given for individual species.

Peduncles 1 per axil, 1-flowered. *Pedicels* absent or very short, when present hidden within the fused or overlapping bases of the two bracteoles. *Flower buds* with erect petals and stamens; apex acute. *Stamens* free. *Anthers* dorsifixed, versatile, with ± parallel, longitudinally dehiscent cells; connective gland dorsal. *Ovary* fully inferior, 1-locular; ovules 2, collateral. *Style* slender, glabrous; base arising at summit of ovary; stigma capitate, small. *Fruits* indehiscent, fully inferior, 1-seeded. *Seed* erect, circular in T.S., with a membranous testa.

Calytrix decandra group

Craven (1987, 1990) included six species in the *C. decandra* group. Members of this group are glabrous, and have a long hypanthium, awned sepals, less than 30 stamens (usually 10–25) in a single series, and a persistent style. The connective gland is often large and sometimes restricts anther movement. Now seven species are recognised in this group.

Key to members of the *C. decandra* group

1. Bracteoles connate, viscid. Hypanthium 5-ribbed. Corolla dichromatic at anthesis, pink to purple with a white to yellow centre, the centre becoming more deeply coloured later

2. Leaves ± terete, 5–15 mm long; apical point absent or up to 0.2 mm long. Sepals 14–20 mm long. Petals 9–12.5 mm long (Geraldton area–Paynes Find area–S of Perth) ..... **C. glutinosa**

2: Leaves somewhat angled, 2.5–4 mm long; apical point 0.2–0.6 mm long. Sepals 10–13 mm long. Petals 6–7 mm long (Jackson Ra. area) ..... **C. viscida**

1: Bracteoles free or connate, not viscid. Hypanthium 10-ribbed. Corolla white, pink or purple throughout

3. Bracteoles connate, persistent in fruit

4. Leaves alternate. Bracteoles 3.5–4.5 mm long. Sepals 18–26 mm long. Ovules 2 (Meekatharra area) ..... **C. verruculosa**

4: Leaves decussate. Bracteoles 8–11 mm long. Sepals 10–16 mm long. Ovules 3 or 4 (Wiluna–Menzies area) ..... **C. praecipua**

3: Bracteoles free, deciduous

5. Leaves with a recurved apex, the apical point ± at right angles to the remainder of the leaf. Petals white. Stamens over 20, usually 22–26. Anthers apparently versatile (Yalgoo–Wiluna area) ..... **C. uncinata**

5: Leaves with a straight apex or apical point. Petals pink to purple. Stamens 9–16. Anthers with restricted movement

6. Leaf blades 1.2–3.3 mm long. Stamens 9–16, varying in number between flowers (Hyden–Fraser Ra.) ..... **C. duplistipulata**

6: Leaf blades 4–11 mm long. Stamens 10 in each flower (Bremer Bay–Israelite Bay) ..... **C. decandra**

Calytrix viscida Rye, *sp. nov.*

Typus: Jackson Range, Western Australia [precise locality withheld for conservation reasons], 27 August 2006, *G. Cockerton, B. Eckermann, S. McNee & G. O'Keefe* LCH 13786 (*holo*: PERTH 08391696; *iso*: CANB, MEL).

Calytrix sp. Jackson Range (G. Cockerton et al. LCH 13786); Western Australian Herbarium, in *FloraBase*, http://florabase.dpaw.wa.gov.au/ [accessed 13 August 2013].

Shrub up to 0.5 m high, width not recorded. *Young stems* glabrous. *Leaves* alternate, glabrous. *Stipules* present on young leaves. *Petioles* well defined, 0.4–0.6 mm long. *Leaf blades* concolorous, oblong-elliptic to narrowly oblong in outline, 2.5–4 mm long, 0.6–1 mm wide, 0.7–0.9 mm thick, minutely denticulate on distal margins, entire below; apical point 0.3–0.35 mm long. *Peduncles* poorly defined,

2–3 mm long at maturity. *Bracteoles* persistent in late fruit, connate for about half their length, 5–7 mm long; apical point 0.2–0.6 mm long. *Flowers* 5-merous, 10–15 mm diam. (20–25 mm diam. including the sepal awns). *Hypanthium* 8–9 mm long, glabrous, 5-ribbed; ovarian part fusiform, terete, 4–5 mm long; stylar part cylindrical, 3–4 mm long, free from style. *Sepals* 10–13 mm long, glabrous, widely spreading in fruit; awn 9–11 mm long, minutely scabrid. *Petals* 6–7 mm long, dichromatic, yellowish at the base, elsewhere medium pink. *Staminodes* absent. *Stamens* usually 15–18, in 1 series. *Largest filaments* 4–5 mm long, bright yellow. *Anthers* (prior to dehiscence) narrowly dorsifixed towards the base, 0.5–0.55 mm long, with a broad connective that restricts the movement of the anther; connective gland large, lying parallel to thecae and sometimes slightly protruding above them at apex, broad at the base and tapering distally, 0.4–0.45 mm long. *Style* 9–11 mm long; base enclosed in a cavity above the ovary in a collar formed by the staminal disc. *Fruits c.* 1 mm diam.; hypanthium fusiform-obovoid, 8–9 mm long, *c.* 0.4 mm diam. at its narrowest point. *Seed* narrowly obovoid, *c.* 3.5 mm long, 0.7–0.8 mm diam., tapering to the base.

Diagnostic features. *Young stems* glabrous. *Leaves* 2.5–4.5 mm long; apical point *c.* 0.3 mm long. *Bracteoles* connate for much of their length, viscid. *Flowers* glabrous. *Hypanthium* 8–9 mm long, free from style, 5-ribbed. *Sepals* 10–13 mm long. *Petals* 6–7 mm long, pink with a yellowish base. *Stamens* 15–18. *Style* 9–11 mm long.

Other specimens examined. WESTERN AUSTRALIA [localities withheld for conservation reasons]: 10 Sep. 2008, *S. Burgess & A. Majimbi* LCH 30097 (PERTH); 22 Oct. 2011, *J. Warden & S. Colwill* WB 31927 (PERTH).

Distribution and habitat. Occurs south of Jackson Range (Figure 1), with one record from a low duricrust rise and another record from shallow soil with ironstone gravel, in both cases associated with *Melaleuca hamata* and *M. leiocarpa*.

Phenology. Flowers recorded in August and September. Mature fruits recorded in late October.

Etymology. Like *C. glutinosa* Lindl., this species is named to reflect its viscid bracteoles.

Conservation status. Recently listed, under the name *C.* sp. Jackson Range (G. Cockerton et al. LCH 13786), as Priority One under Department of Parks and Wildlife (DPaW; formerly the Department of Environment and Conservation) Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–). The known range extends for a distance of *c.* 100 km in an inland area where botanical collections have been relatively sparse.

Affinities. This recently discovered species is similar to *C. glutinosa* in having viscid, connate bracteoles, a 5-ribbed hypanthium that is free from the style, and between 10 and 20 stamens, but differs in its smaller, more angled leaves, with a more prominent apical point, its smaller flowers and its more inland distribution.

Notes. The closely related species *C. glutinosa* is fairly widely distributed and variable, with north-eastern, inland specimens (see Figure 1) differing from the more coastal and southern specimens in having leaves densely and irregularly tuberculate, while some specimens in the intermediate region have leaves that are intermediate in morphology. *Calytrix viscida* occurs much further inland and has smooth leaves.

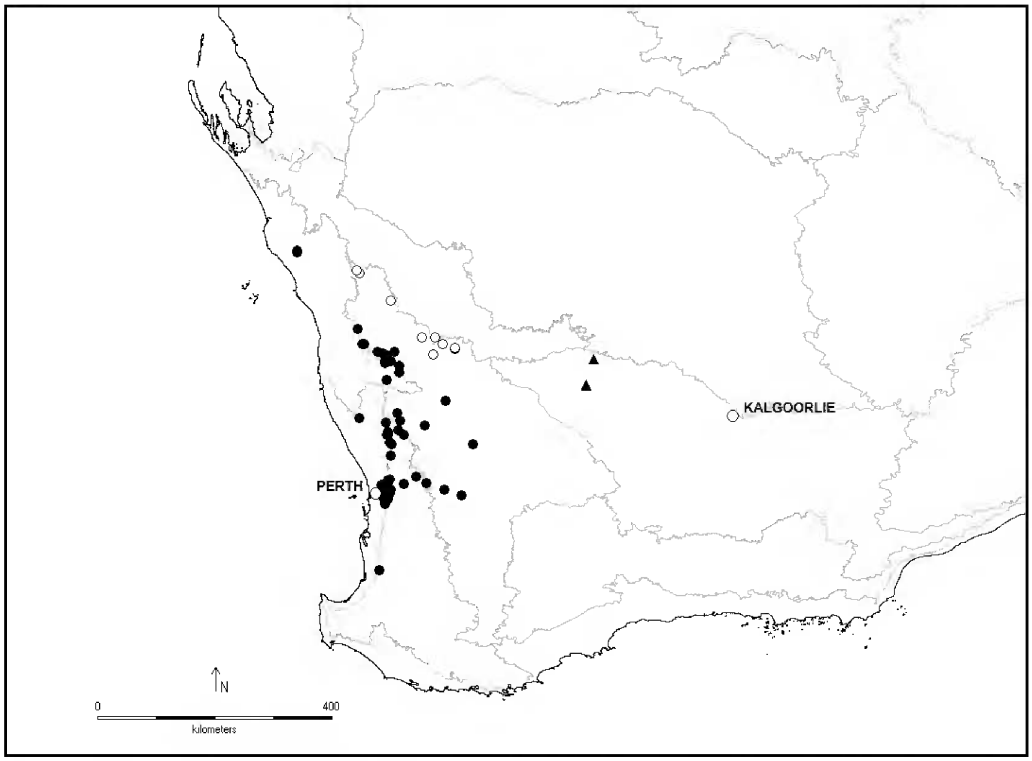

Figure 1. Distribution of *Calytrix glutinosa* typical specimens (●) and tuberculate-leaved specimens (○) and *C. viscida* (▲).

Calytrix exstipulata alliance

The *C. exstipulata* alliance is widespread in the northern half of Australia and most of the species included in it do not occur in Western Australia. Craven (1987: 17) described this alliance as having glabrous stems, 20–70 stamens in more than one series, and a hypanthium that is free or partly free from the persistent style. While only three such species are currently recognised for Western Australia, Craven (1990) noted that *C. exstipulata* had many variants, especially in the Kimberley region of Western Australia, and discussed several instances of the co-occurrence of variants within this very difficult complex. It also appears that the limits of this alliance need to be enlarged to allow inclusion of the Kimberley species, *C. gomphrenoides* M.D.Barrett & Craven, which has fewer stamens in a single series (see Barrett *et al.* 2009).

Key to Western Australian members of the *C. exstipulata* alliance

1. Bracteoles with a long-ciliate keel; longest cilia 0.5–1.5 mm long. Stamens 16–18, in 1 series (Prince Regent River area) ..... **C. gomphrenoides**

1: Bracteoles with an entire to ciliate keel; longest cilia less than 0.5 mm long. Stamens 20–50, in 2 or 3 series

2. Bracteoles free or united, strongly keeled, the keel resembling a narrow wing (Broome area–S of Wiluna–N of Quilpie, Queensland) ..... **C. carinata**

2: Bracteoles united, not strongly keeled

3. Leaves 0.5–2(–4.5) mm long. Flowers pink (Kalumburu area–Broome area–Winton area, Queensland) ..... **C. exstipulata** complex

3: Leaves 4–7 mm long. Flowers yellow (Sandstone area–Laverton area) ..... **C. hislopii**

Calytrix hislopii Rye, *sp. nov.*

Typus: north of Sandstone, Western Australia [precise locality withheld for conservation reasons], 19 September 2005, *D.J. Edinger* 5498 (*holo*: PERTH 07284438).

Calytrix sp. Sandstone (D.J. Edinger 5498); Western Australian Herbarium, in *FloraBase*, http://florabase.dpaw.wa.gov.au/ [accessed 13 August 2013].

Shrub 0.1–1 m high, described at one locality as a 'squat gnarled sub shrub'. *Young stems* glabrous, initially with a smooth, pale epidermis. *Leaves* alternate. *Stipules* absent or very inconspicuous. *Petioles* poorly defined, 0.8–1.2 mm long. *Leaf blades* ± concolorous, narrowly elliptic-oblong to linear in outline (or slightly broader distally than towards base), 4–7 mm long, 0.7–1.2 mm wide, 0.3–0.7 mm thick, minutely denticulate or minutely ciliolate on margins and also distally along midrib, glabrous elsewhere; apical point 0.3–0.7 mm long. *Peduncles* 1–1.5 mm long. *Bracteoles* persistent, connate at base, 6–7 mm long, glabrous; connate part 1.5–2.5 mm long, tapering towards the base; terminal point absent or up to 0.5 mm long. *Flowers* 5-merous, 13–15 mm diam. (22–27 mm diam. including the sepal awns), glabrous. *Hypanthium* 6–9 mm long, 5-ribbed; ovarian part fusiform, terete, 3–4 mm long; stylar part cylindrical, 3–5 mm long, free from style. *Sepals* spreading, 11–14 mm long; awn 7–9 mm long, scabrid. *Petals* 6–7.5 mm long, yellow. *Staminodes* absent. *Stamens* 25–40, in 2 or more close series. *Largest filaments* 4.5–6 mm long. *Anthers* (prior to dehiscence) narrowly dorsifixed, 0.3–0.5 mm long; connective gland compact, not reaching apex of anther, *c.* 0.15 mm long. *Style* 8–11 mm long, persistent in fruit. *Fruits* not seen at maturity.

Diagnostic features. *Young stems* glabrous. *Leaf blades* 4–7 mm long, minutely denticulate to ciliolate. *Bracteoles* connate at base. *Flowers* glabrous. *Hypanthium* 6–9 mm long, free from style, 5-ribbed. *Sepals* 11–14 mm long. *Petals* 6–7.5 mm long, yellow. *Stamens* 25–40. *Style* 8–11 mm long.

Other specimens examined. WESTERN AUSTRALIA [localities withheld for conservation reasons]: 16 Sep. 2004, *D.J. Edinger* 4807A *& G. Marsh* (PERTH); 31 Aug. 2012, *M. Gannaway* MG 039 (PERTH); Sep. 1975, *N.G. Marchant* 75/287 (PERTH).

Distribution and habitat. Recorded in the Sandstone, Laverton and Leonora areas (Figure 2) on a lateritic ridge, the top of a breakaway and on granite.

Phenology. Flowers recorded in August and September.

Etymology. Named after Michael Hislop, who has an exceptional ability to identify species in all families of the Western Australian flora. Mike established the informal name for this species in 2010 and he previously drew my attention to the need to reinstate *C. watsonii*.

Conservation status. DPaW Conservation Codes for Western Australian Flora: Priority Three; listed by Smith (2012) as *C.* sp. Sandstone (D.J. Edinger 5498). The three collections of this species are from two regions that are more than 350 km apart. Since these collections are from a remote part of the State, it seems likely that further populations will be discovered.

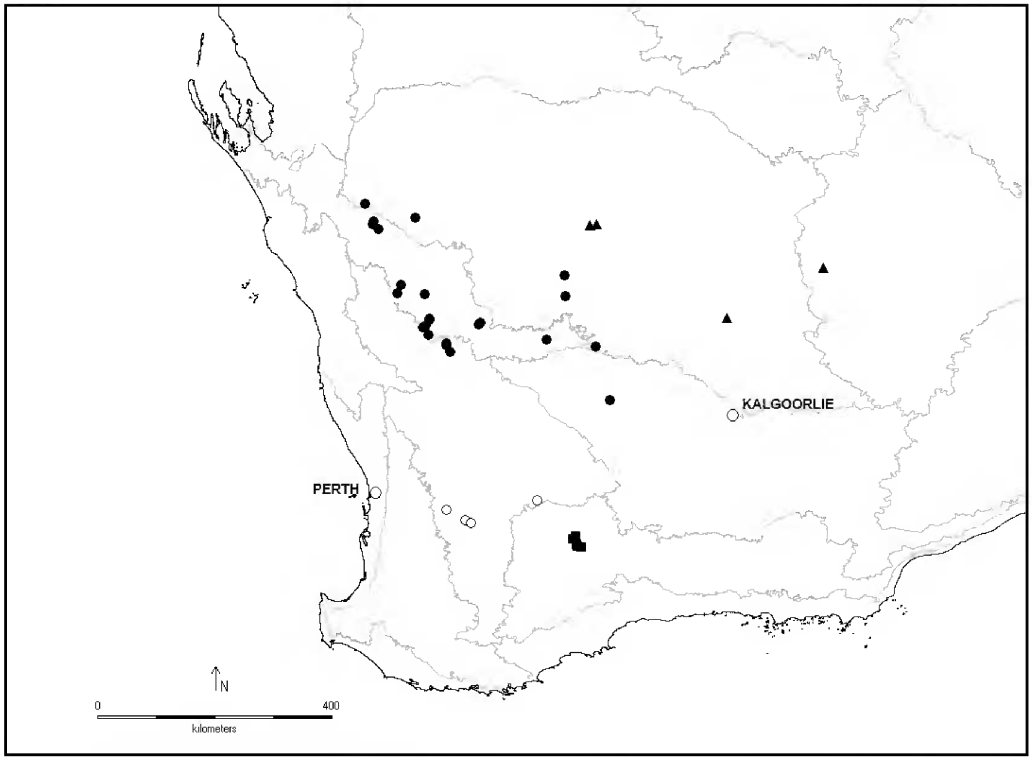

Figure 2. Distribution of *Calytrix* sp. Paynes Find (F. & J. Hort 1188) (●), *C. hislopii* (▲), *C. patrickiae* (■) and *C. sagei* (○).

Affinities. This species belongs to the *C. exstipulata* alliance. It is the only yellow-flowered member of that alliance in Western Australia but there is a predominantly yellow-flowered species, *C. gurumuldensis* Craven, in Queensland.

Notes. The species needs to be examined in the field to determine whether its yellow flowers are dichromatic as in other members of the *C. exstipulata* alliance or differ in being monochromatic.

Calytrix flavescens alliance

Craven (1987: 17) described the five species he included in this alliance as having monochromatic, yellow flowers with a trigonous hypanthium. Now six species are recognised. All members of the alliance are restricted to the south-west of Western Australia. They have free or basally connate bracteoles, the hypanthium adnate to the style, the free part of which is deciduous in fruit, and 15–85 stamens in more than one series.

Key to members of the *Calytrix flavescens* alliance

1. Bracteoles basally connate. Ovarian part of hypanthium compressed-trigonous, with the abaxial surface narrower than the other two surfaces (Kalbarri area–Watheroo NP) ..... **C. drummondii**

1: Bracteoles free. Ovarian part of hypanthium trigonous, with the three surfaces of equal width

2. Leaves flat, (1.5–)2–5 mm wide, with ciliate margins and midvein. Bracteoles 9–11 mm long (N of Eneabba–S of Pinjarra) ..... **C. aurea**

2: Leaves very thick to compressed, but always with the midrib thick, 0.5–1.5 mm wide, glabrous or scabrid. Bracteoles 2–9 mm long

3. Bracteoles ovate or narrowly ovate, not turgid or rarely slightly turgid (S of Geraldton–Jerramungup area) ..... **C. flavescens**

3: Bracteoles narrowly elliptic to spathulate, turgid towards the apex

4. Scarious margin of bracteoles broad distally, often toothed. Occurring north of Perth (Eneabba area) ..... **C. chrysantha**

4: Scarious margin of bracteoles tapering distally or uniformly narrow, entire. Occurring east or south of Perth

5. Leaves 0.5–1 mm wide. Stamens 40–60 (Denmark–Bremer Bay area) ..... **C. asperula**

5: Leaves 0.9–1.5 mm wide. Stamens 15–25 (Narembeen area) ..... **C. sagei**

Calytrix sagei Rye, *sp. nov.*

Typus: north-east of Pingelly, Western Australia [precise locality withheld for conservation reasons], 7 November 1998, *F. Obbens, R. Davis & L.W. Sage* LWS 1332 (*holo*: PERTH 05244749; *iso*: CANB).

Calytrix sp. Jingaring (F. Obbens, R. Davis & L.W. Sage LWS1332) in G. Paczkowska & A.R. Chapman, *West. Austral. Fl.: Descr. Cat.* p. 354 (2000); Western Australian Herbarium, in *FloraBase*, http://florabase.dpaw.wa.gov.au/ [accessed 13 August 2013].

Shrub 0.2–0.4 m high, one record as 'compact' and another as 0.2 m wide, glabrous. *Young stems* with multiple longitudinal rows of minute, ± square cells. *Leaves* alternate, glabrous. *Stipules* present on young leaves, up to 0.4 mm long. *Petioles* poorly or well defined, 0.3–0.5 mm long. *Leaf blades* ± concolorous, usually narrowly oblong to obovate in outline, 2.5–3.5 mm long, 0.9–1.5 mm wide, with a concave adaxial surface (i.e. ± lunate in T.S.), the thickness overall (including the adaxial cavity as part of the overall shape) usually 0.5–0.7 mm but relatively thin at any given point on the leaf, with entire margins; apex incurved, not pointed. *Peduncles* well defined, 0.5–0.8 mm long at maturity. *Bracteoles* persistent in early fruit, free, spathulate, 4.5–6 mm long, the clawed base 1.5–2 mm long; apex incurved, not or scarcely pointed. *Flowers* 5-merous, 8–10 mm diam. (10–20 mm diam. including the sepal awns, which are strongly curved in bud, more gently curved in flower and ± straight in fruit), glabrous. *Hypanthium* 8–10.5 mm long; ovarian part swollen, trigonous, usually 4–4.5 mm long; stylar part narrowly cylindrical, 4–6 mm long, adnate to style, with 5–10 ribs. *Sepals* spreading in fruit, 10–12 mm long; awn 8–10 mm long, minutely scabrid. *Petals* 4–6 mm long, yellow or cream. *Staminodes* absent. *Stamens* 15–25, in 2 or more close series. *Largest filaments* 3–3.5 mm long. *Anthers* (prior to dehiscence) narrowly dorsifixed, 0.3–0.5 mm long; connective gland globular, below apex of anther, *c.* 0.15 mm long. *Style* 7.5–9.5 mm long; free part deciduous, 3–5 mm long. *Fruits* not seen at maturity.

Diagnostic features. *Young stems* glabrous. *Leaf blades* 2.5–3.5 mm long. *Bracteoles* free. *Flowers* glabrous. *Hypanthium* 8–10.5 mm long, adnate to style, trigonous on ovarian part. *Sepals* 10–12 mm long. *Petals* 4–6 mm long, yellow or cream. *Stamens* 15–25. *Style* 7.5–9.5 mm long.

Specimens examined. WESTERN AUSTRALIA [localities withheld for conservation reasons]: Sep. 1929, *W.E. Blackall s.n.* (PERTH); 21 Oct. 1983, *R.J. Cranfield* 4497 (CANB, K, PERTH); 28 Oct. 2002, *T. Watson* 393 (PERTH).

Distribution and habitat. Extends from the Beverley area east to near Narembeen (Figure 2). Recorded in varied habitats including the margins of salt lakes and in sandy clay with underlying granite.

Phenology. Flowers recorded October and November.

Etymology. Named after Leigh Sage, who allocated an informal name to the species in January 1999. He and the other two collectors of the type material produced a joint publication (Obbens *et al.* 2001) that listed this species. Leigh has worked extensively on the taxonomy of the Goodeniaceae.

Conservation status. DPaW Conservation Codes for Western Australian Flora: Priority Two; listed by Smith (2012) as *C.* sp. Jingaring (F. Obbens, R. Davis & L.W. Sage LWS1332). This species is known from four collections over a range about 130 km long.

Affinities. Previously included within *C. asperula* (Schauer) Benth. but differing from that species in its broader leaves, fewer stamens and its more northern distribution. Its bracteoles are of a shape that is common in *C. asperula* but they tend to be longer in *C. sagei*.

Notes. At the time of Craven's (1987) revision, only one specimen (*W.E. Blackall s.n.* Sep. 1929) of *C. sagei* had been collected and hence the species was too poorly known to describe adequately. Craven cited Blackall's specimen under its closest relative, *C. asperula*.

Calytrix simplex alliance

This is a new alliance, not one of the alliances Craven (1987) listed, although he did indicate that *C. simplex* Lindl. and *C. plumulosa* (F.Muell.) B.D.Jacks. were closely related and placed them in adjacent positions within the *C. variabilis* group. *Calytrix sapphirina* Lindl. is tentatively also included in this alliance since it matches those two species in most characters and is similar to the new species *C. patrickiae* Rye in having the flowers densely clustered. This alliance of four species is restricted to the south-west of Western Australia, extending from the west coast eastwards through most of the wheatbelt but not reaching the south coast. Its species have hairy stems, a 10-ribbed hypanthium that is adnate to the style, pink to purple petals and 25–75 stamens in more than one series.

Key to members of the *Calytrix simplex* alliance

1. Corolla monochromatic, pink to purple throughout (Kalbarri area to east of Lake King)..... **C. sapphirina**

1: Corolla dichromatic, pink to purple with a yellowish centre

2. Flowers densely clustered at the ends of the branchlets into globular, head-like inflorescences subtended by opposite-decussate leaves. Hypanthium 3.5–4.5 mm long. Sepals 3–4.5 mm long. Petals 3.5–5 mm long (Dragon Rocks area) ..... **C. patrickiae**

2: Flowers loosely clustered at the ends of the branchlets into spike-like or more globular inflorescences, the leaves below usually alternate or subopposite. Hypanthium 4.5–9.5 mm long. Sepals 8–13 mm long. Petals 6.5–10 mm long

3. Leaves ± terete. Sepals obviously hairy on the base; awn with fine hairs 0.4–0.8 mm long (Bunjil–Chiddarcooping Hill Nature Reserve) ..... **C. plumulosa**

3: Leaves compressed or concave on adaxial surface. Sepals with base glabrous; awn with minute hairs up to 0.3 mm long

4. Leaf blades 6–11 mm long. Hypanthium 8.5–9.5 mm long. Petals ovate (Armadale–Boddington area) ..... **C. simplex** subsp. **simplex**

4: Leaf blades 2–8 mm long. Hypanthium 4.5–8.5 mm long. Petals elliptic to ovate (Darling Range–Newdegate area) ..... **C. simplex** subsp. **suboppositifolia**

Calytrix patrickiae Rye, *sp. nov.*

Typus: Dragon Rocks Nature Reserve, Western Australia [precise locality withheld for conservation reasons], 7 October 1991, *A.M. Coates* 3118 (*holo*: PERTH 05151937; *iso*: CANB, K).

Calytrix sp. Dragon Rocks (K. Kershaw & L. Kerrigan KK 2180); Western Australian Herbarium, in *FloraBase*, http://florabase.dpaw.wa.gov.au/ [accessed 13 August 2013].

Shrub 0.1–0.4 m high, spreading, much branched. *Young stems* with numerous patent hairs 0.1–0.3 mm long. *Leaves* usually strictly opposite and decussate throughout, rarely partially subopposite to irregular. *Stipules* present on young leaves, up to 0.8 mm long. *Petioles* absent to well defined, 0–0.5 mm long. *Leaf blades* ± concolorous, ovate to narrowly oblong in outline, 3–4.5 mm long, 0.6–1.2 mm wide, 0.2–0.6 mm thick, lunate in T.S., usually minutely hairy, rarely glabrous; apex not or scarcely pointed; hairs mostly 0.15–0.25 mm long but with some terminal or marginal hairs up to 0.5 mm long. *Peduncles* hidden within the base of the subtending leaf, 0.5–0.8 mm long at maturity, ± glabrous. *Bracteoles* persistent, shortly connate at base or ± free, 3–4.5 mm long, usually hairy along the midrib; point absent or up to 0.2 mm long. *Flowers* 5-merous, 8–10 mm diam., the sepal awns not protruding. *Hypanthium* 3.5–4.5 mm long, 10-ribbed; ovarian part ± fusiform, terete, *c.* 2.5 mm long, hairy; stylar part cylindrical, 1–2 mm long, adnate to style, glabrous or with scattered hairs. *Sepals* spreading, 3–4.5 mm long, with fine hairs; awn 2–3 mm long, with spreading hairs 0.4–0.8 mm long. *Petals* 3.5–5 mm long, dichromatic, yellow at base, medium to deep purple over most of length, usually sparsely hairy distally along midrib of lower surface. *Staminodes* absent. *Stamens* 30–40, in 2 or more close series. *Largest filaments* 3–3.5 mm long. *Anthers* (prior to dehiscence) narrowly dorsifixed, 0.2–0.3 mm long; connective gland covering distal half of dorsal surface and protruding distally, *c.* 0.15 mm long. *Style* 3.5–5.5 mm long; free part deciduous in fruit, 2.5–4 mm long. *Fruits* 0.5–0.75 mm diam.; hypanthium 5.5–6.5 mm long, with a swollen base (around the seed) 2.5–3.5 mm long, slender above, *c.* 0.2 mm diam. at its narrowest point. *Seed* narrowly obovoid, 2.3–2.4 mm long, 0.35–0.5 mm diam., tapering to the base.

Diagnostic features. *Young stems* hairy. *Leaves* opposite; blade 3–4.5 mm long. *Bracteoles* shortly connate or ± free. *Flowers* hairy outside on hypanthium and sepals. *Hypanthium* 3.5–4.5 mm long, adnate to style, 10-ribbed. *Sepals* 3–4 mm long. *Petals* 3.5–5 mm long, medium to deep purple with a yellow base, mostly with a few hairs on lower surface. *Stamens* 30–40. *Style* 3.5–5 mm long.

Selected specimens examined. WESTERN AUSTRALIA [localities withheld for conservation reasons]: 24 Oct. 2007, *T. Erickson* TEE 149 (PERTH); 3 Oct. 2000, *K. Kershaw & L. Kerrigan* KK 2180 (PERTH).

Distribution and habitat. Occurs in the region north of Newdegate (Figure 2), in rich heathlands in

sand, often also with gravel present. Other *Calytrix* species which appear to occur with *C. patrickiae* are *C. breviseta* Lindl., *C. leschenaultii*, and *C. violacea* (Lindl.) Craven. *Calytrix simplex* has also been recorded from the area but not collected at the same time as *C. patrickiae*.

Phenology. Flowers recorded September and October and mature fruits recorded in late October.

Etymology. Named after Sue Patrick, who gave this species its informal name in 2003. Sue conducted valuable field surveys of numerous Western Australian species with conservation priority and was also a prolific illustrator of native plants.

Conservation status. DPaW Conservation Codes for Western Australian Flora: Priority Two; listed by Smith (2012) as *C.* sp. Dragon Rocks (K. Kershaw & L. Kerrigan KK 2180). This species is known from at least seven collections but its known range is very restricted, being about 20 km long.

Affinities. This species was unknown at the time of Craven's (1987) revision but comes out in Key 1, couplet 37 with *C. plumulosa*, from which it differs in having leaves lunate in transverse section, and *C. simplex*, from which it differs in its more hairy sepals and its bracteoles being free for a greater proportion of their length. It differs from both those species in its usually strictly opposite-decussate leaves and its more densely clustered, smaller flowers, with the sepals tending to be smaller than the petals.

Some specimens of *C. patrickiae* have been misidentified as *C. strigosa* but differ from that species in having opposite leaves and more densely clustered, smaller flowers with the hypanthium adnate to the style.

In its densely clustered flowers *C. patrickiae* resembles the *C. violacea* group, which includes a few species such as *C. nematoclada* Craven that have opposite-decussate leaves like *C. patrickiae*. The *C. violacea* group differs in having the hypanthium terminating at the top of the ovary rather than being extended beyond the summit of the ovary as in *C. patrickiae*.

Notes. *Calytrix patrickiae* overlaps in range with *C. simplex* subsp. *suboppositifolia* Craven, which may tend to flower earlier in the year. One specimen, *A.M. Coates* 32790, is atypical in having the leaves and bracteoles glabrous.

Calytrix strigosa alliance

This is another new Western Australian alliance, comprising the taxa that Craven (1987) included within *C. strigosa s. lat.* Although Craven (1987) placed *C. strigosa s. lat.* between *C. similis* Craven and *C. desolata* S.Moore in his systematic arrangement of the species, he did not consider *C. strigosa* to be close to either of those species. However, he noted on page 86 (see also page 18) that *C. strigosa* might possibly have distant links to *C. violacea*.

The *C. strigosa* alliance extends along the west coast between Dirk Hartog Island and Perth and well inland to the Wiluna area, and has an isolated occurrence to the north in the Kennedy Range. The alliance is characterised by the presence of hairs on the outside of the hypathium and sepals, also with at least a few hairs on the distal outer surface of the petals. The 5-ribbed hypanthium is free from the style, which is closely enclosed in a collar at the summit of the hypanthium, a structure Craven (1987:

85) described as 'the staminal disc produced inwards, with the inner edge turning upwards forming a slight collar'. The sepal awns are poorly defined, tapering fairly uniformly from a broad base to the apex. There are 25–90 stamens, in more than one series, and the style is persistent in fruit.

Key to members of the *Calytrix strigosa* alliance

1. Petals yellow. Stamens 45–90

2. Leaf blades 2–3 mm long, ciliate along margins and often on midvein but often glabrous elsewhere, with scattered oil glands. Occurs on red sand dunes or in orange to yellow sand, rarely over banded ironstone

3. Leaf blades ciliate along margins and often on midvein but glabrous or subglabrous elsewhere. Stamens 45–70 (Wiluna–Lake Goongarrie) ..... **C. watsonii**

3: Leaf blades with numerous hairs on all surfaces. Stamens 80–90 (Youanmi area) ..... **C.** sp. aff. **watsonii**

2: Leaf blades 5–7 mm long, rather densely hairy throughout, with numerous oil glands. Occurs in sandy rock crevices in sandstone (Kennedy Range NP) ..... **C.** sp. **Kennedy Range**

1: Petals medium to deep pink or purple with a yellow base. Stamens 25–55

4. Leaf blades 1.5–3.5 mm long, with numerous hairs 0.05–0.3 mm long. Hypanthium 4.5–6 mm long. Petals 6–9 mm long (New Forest Station–Whitewells Station) ..... **C.** sp. **Paynes Find**

4: Leaf blades 2–8.5 mm long, glabrous or with few to numerous hairs 0.1–0.5 mm long. Hypanthium (6–)7–14 mm long. Petals (6–)8–12 mm long (Dirk Hartog Island–near Perth–Merredin) ..... **C. strigosa**

1. Pink- or purple-flowered material

Pink- or purple-flowered specimens of this alliance are currently housed either under *C. strigosa* or under *C.* sp. Paynes Find (F. & J. Hort 1188), but no absolutely reliable characters have been found in this study to separate the two taxa. The difficulty of separating them could be due to the presence of hybrids and intergradation in the relatively small area where their distributions overlap.

There is one other published name, *Calycothrix lasiantha* Meisn., available for the very variable material currently housed under *Calytrix strigosa*. *Calycothrix* Meisn. *nom. illeg.* is an invalid alternative name for *Calytrix*. Further work is needed to determine how many pink-flowered taxa should be recognised as species or infraspecific categories. It would be premature to give full descriptions now for the two taxa included in the above key. The diagnostic characters currently being used to distinguish them, although not completely reliable, are listed below.

Calytrix strigosa A.Cunn., *in* W.J. Hooker, *Bot. Mag.* 61: sub t. 3323 (1834). *Calycothrix strigosa* (A.Cunn.) Schauer, *Nov. Actorum Acad. Caes. Leop.-Carol. Nat. Cur.*19, Suppl. 2: 260 (1841). *Type*: Dirk Hartog's Island, W. Coast [Dirk Hartog Island, Western Australia], Jan. 1822, *A. Cunningham* 233 (*holo*: K 000821906; *iso*: BM 00101564, MEL 544997).

Calycothrix lasiantha Meisn., *J. Linn. Soc., Bot.* 1: 46 (1857). *Calytrix lasiantha* (Meisn.) Benth., *Fl. Austral.* 3: 48 (1867), *nom. inval. Type*: near Colbourne Springs [between Arrowsmith River and Irwin River], Western Australia, 1850–1851, *J. Drummond* 6: 53 (*holo*: NY *n.v.*, *fide* Craven (1987: 85); *iso*: E 00288199, G 00227562 & 0027563, K 000821908, MEL 544998, W *n.v.*).

Illustrations. W.E. Blackall & B.J. Grieve, *How Know W. Austral. Wildflowers* 3A: 55, 57 (1980). There is also a line drawing on *C.A. Gardner* 2549.

Diagnostic features. *Young stems* glabrous to densely hairy. *Bracteoles* connate at base. *Flowers* hairy outside on hypanthium and sepals. *Hypanthium* (6–)7–14 mm long, free from style, 5-ribbed. *Sepals* 6–14 mm long. *Petals* 6–12 mm long, pale to medium pink or purple with a yellow base, distally hairy on lower surface. *Stamens* 25–50. *Style* 5.5–16 mm long.

Selected specimens examined. WESTERN AUSTRALIA: *c.* 10 km N of Bibby Giddy Outcamp on Heirisson Prong, S of Clough's Bar track at *c.* 1.5 km along track from junction with Useless Loop Rd, 25 Sep. 1997, *A. Markey* 1312 (PERTH); Dirk Hartog (Turtle Bay–Cape Inscription), 26 July 1988, *Ph. Morat* 8397 (PERTH); Cunderdine–Minnivale Rd, 0.5 km N of Goomalling–Merriden Rd, Namelkatchem Nature Reserve, 18 Oct. 2013, *R. Davis & B.L. Rye* DR13 (PERTH); Indarra Springs, from windmill left on track to start of track to spring, 30 Sep. 1998, *G. Stapp* 191 (PERTH).

Distribution and habitat. Extends from Dirk Hartog Island along the west coast to near Perth and from there inland to near Merredin (Figure 3). Occurs mainly in sandy habitats.

Phenology. Flowers mainly from August to November, also recorded April and May.

Etymology. From the Latin *striga* (a swath), presumably referring to the long hairs all lying in the same orientation on the sepals.

Conservation status. Not considered to be at risk.

Affinities. See the notes under *C.* sp. Paynes Find and *C. watsonii*.

Notes. Specimens from Dirk Hartog Island, where the type of *C. strigosa* was collected, are at the extreme north-west of the range of the species; they have glabrous stems and leaves, and short, glabrous bracteoles. On the nearby mainland of Shark Bay, the specimens are similar in their lack of hairs but have long bracteoles and broad, more or less ovate leaves.

In the far south-east of the range, all specimens have hairy stems and leaves, although varying in the density and length of the hairs. Through the remainder of the range of *C. strigosa*, specimens vary from completely glabrous on the stems and leaves through sparsely hairy or with minute hairs through to moderately densely hairy with moderate-sized hairs. Leaf shape also varies greatly, as does the degree of hairiness of the flowers.

Calytrix sp. **Paynes Find** (F. & J. Hort 1188); Western Australian Herbarium, in *FloraBase*, http://florabase.dpaw.wa.gov.au/ [accessed 13 August 2013].

Diagnostic features. *Young stems* hairy. *Bracteoles* connate at base. *Flowers* hairy outside on hypanthium and sepals. *Hypanthium* 4.5–6 mm long, free from style, 5-ribbed. *Sepals* 5–8 mm long. *Petals* 6–9 mm long, pale to medium pink or purple with a yellow base. *Stamens* 35–55. *Style* 6–9 mm long.

Selected specimens examined. WESTERN AUSTRALIA: 4.2 km S of homestead, White Wells Station, 10 Apr. 2004, *D.J. Edinger* 3920 & *G. Marsh* (PERTH); Great Northern Hwy, Paynes Find, 135.5 km N of Wubin, 18 Oct. 2000, *F. & J. Hort* 1188 (PERTH); New Forest–Yallalong road, *c.* 2.4 km E of New

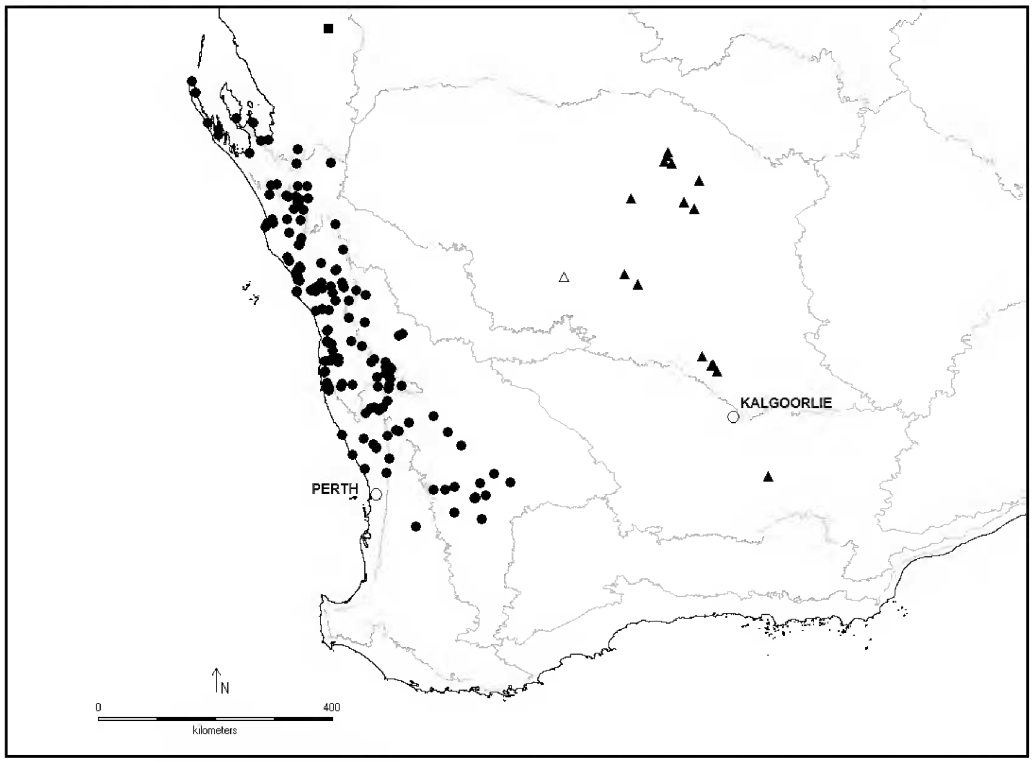

Figure 3. Distribution of *Calytrix strigosa* (●), *C. watsonii* (▲), *C.* sp. Kennedy Range (A. Markey & S. Dillon 6301) (■) and *C.* sp. *aff. watsonii* (△).

Forest Homestead, 17 Sep. 2008, *F. & J. Hort & F. Obbens* 3255 (MEL, NSW, PERTH); 15.5 km SW of Bungalbin Hill, 4 km W of Haul Rd, 2 Nov. 2010, *S. Reiffer* SRE 509 (PERTH); 3.1 miles [5 km] E of No 1 Rabbit Proof Fence on old track to Diemals, 26 Sep. 1997, *B.H. Smith* 1893 (PERTH); 32 km S of Youanmi Mine, 24 Sep. 1991, *Peter G. Wilson* 1244 *& R. Rowe* (PERTH).

Distribution and habitat. Extends from New Forest Station south-east to near Whitewells Station (Figure 2), commonly recorded in red sand, sometimes in yellow to brown sandy soil, sometimes over laterite or other rock substrates.

Phenology. Flowers from June to December, also recorded April. Fruits mainly recorded from July to December.

Conservation status. Not considered to be at risk.

Affinities. Distinguished from *C. strigosa* by its usually shorter and broader hypanthium. Unlike *C. strigosa*, *C.* sp. Paynes Find always has minutely hairy young stems and leaves. It shows much less variation in other characters too. The geographic range of the latter (Figure 2) is mainly inland of that of *C. strigosa* (Figure 3). In the small area where the two taxa are more or less parapatric or slightly overlapping, they appear to intergrade, although elsewhere they are readily distinguished. The possibility that hybridisation and introgression have occurred in the region of overlap of the two taxa needs further investigation.

Calytrix sp. Paynes Find is also very similar to *C. watsonii*, which differs in having yellow flowers and a number of other characters noted under the latter species. The two taxa are geographically distinct (Figures 2, 3), with *C. watsonii* occurring further inland. However, there is an odd yellow-flowered specimen (*H. Pringle* 3925) from the Youanmi Station area that is somewhat intermediate between them, although it differs from both of them in having more numerous stamens.

Notes. Craven (1987: 86) did not cite any material of *C.* sp. Paynes Find, although he certainly examined several specimens prior to his revision, such as *J.S. Beard* 6706, identifying them as *C. strigosa*.

2. Yellow-flowered material

Three taxa with yellow flowers are known, and they are readily distinguished as in the key above. However, two of these taxa are too poorly known to describe at present as there is only one collection of each.

Calytrix watsonii (F.Muell. & Tate) C.A.Gardner, *Enum. Pl. Austral. Occ.* 96 (1931). *Calycothrix watsonii* F.Muell. & Tate, *Trans. & Proc. Roy. Soc. South Australia* 16: 355 (1896). *Type*: 55 miles [88 km] north-west from Fraser Range, Western Australia, 5 November 1891, *R. Helms s.n.* (*holo*: MEL 545033; *iso*: AD *n.v.*, K000821905, MEL 545032).

Shrub 0.4–1.4 m high, up to 2 m wide. *Young stems* moderately densely hairy, with patent or somewhat retrorse hairs 0.2–0.4 mm long. *Leaves* alternate. *Stipules* present on young leaves, up to 0.4 mm long. *Petioles* well defined, 0.4–1 mm long. *Leaf blades* ± concolorous, elliptic or oblong-elliptic in outline, 2–3 mm long, 0.7–1.4 mm wide, 0.4–0.7 mm thick, with cilia along the margins and often along the midrib of one or both surfaces, the remainder of the leaf glabrous or nearly glabrous; apex not or scarcely pointed; hairs 0.15–0.3 mm long. *Peduncles* well defined, 0.5–2.5 mm long at maturity, hairy. *Bracteoles* persistent in late fruit, connate at base, 3.5–6 mm long; point absent or inconspicuous. *Flowers* 5-merous, 10–15 mm diam., the sepal awns not or scarcely protruding beyond the petals. *Hypanthium* 4.5–7 mm long, hairy, fusiform (the upper narrowed part of the fusiform shape being the stylar part), 5-ribbed; ovarian part terete, 3.5–5.5 mm long; stylar part 1–1.5 mm long, free from style. *Sepals* 5.5–10 mm long, spreading, hairy outside except on margins; awn 3.5–6 mm long, with fine, spreading hairs 0.4–1(–1.3) mm long, concentrated along the margins and also occurring on outer surface, the inner surface glabrous except for a few small hairs towards the apex. *Petals* 6.5–9.5 mm long, pale to medium yellow, hairy on outer surface especially towards apex. *Staminodes* absent. *Stamens* usually 45–70, in 2 or more close series. *Largest filaments* 5–8 mm long. *Anthers* (prior to dehiscence) narrowly dorsifixed, 0.35–0.5 mm long; connective gland large, sometimes slightly protruding at apex of anther, 0.2–0.3 mm long. *Style* 6–8 mm long; base enclosed in a cavity above the ovary in a collar formed by the staminal disc. *Fruits c.* 1.5 mm diam.; hypanthium fusiform-obovoid, *c.* 5 mm long, 0.75–0.8 mm diam. at its narrowest point. *Seed* narrowly obovoid, *c.* 3.5 mm long, 1.2–1.3 mm diam., tapering to the base.

Diagnostic features. *Young stems* hairy. *Leaf blades* 2–3 mm long. *Bracteoles* connate at base. *Flowers* hairy outside on hypanthium and sepals. *Hypanthium* 4.5–7 mm long, free from style, 5-ribbed. *Sepals* 5.5–10 mm long. *Petals* 6.5–9.5 mm long, yellow. *Stamens* 45–80. *Style* 6–8 mm long.

Selected specimens examined. WESTERN AUSTRALIA: Barwidgee Station, Apr. 2004, *L. Boladeras* KB 220 (PERTH); 68.4 km NE of homestead, Lake Mason Station, N of Sandstone, 18 Sep. 2005, *D.J. Edinger* 5477 (PERTH); Comet Vale area, *c.* 90 km N of Kalgoorlie on the Goldfields Hwy,

4 Nov. 2010, *J. Jackson* 196 (PERTH); 29 km SSE Mt Keith, Wanjarri Nature Reserve, 29 Sep. 1992, *G.J. Keighery* 13006 (PERTH); Bulga Downs, Ida Valley–Mt Forrest Conservation Park, 27 Sep. 2006, *R. Meissner & B. Bayliss* 1304 (PERTH); 28 km ENE of Higginsville, 7 May 2011, *N. Murdock* NM 99 (PERTH).

Distribution and habitat. Extends from Wiluna south to east of Kambalda (Figure 3), commonly on red sand dunes, sometimes on orange to yellow sand, with one record from orange sand over banded ironstone. Two collections from the south-east of the distribution were from sandy projections or islands within salt lakes.

Phenology. Flowers from August to November, also recorded April and May. Mature fruits recorded in April.

Etymology. Named after Archibald Watson (1849–1940), who was one of the organisers of the 1891 Elder expedition to the Wiluna area.

Conservation status. Not considered to be at risk.

Affinities. *Calytrix watsonii* is similar to *C.* sp. Paynes Find in the shape of its hypanthium, both taxa differing from *C. strigosa* in this respect. Both *C.* sp. Paynes Find and *C. strigosa* have dichromatic flowers with a yellow centre and with most of the corolla pink to purple whereas *C. watsonii* has yellow petals, also differing in its more inland distribution, and its usually more numerous stamens. Although *C. strigosa* usually has larger flowers than *C. watsonii*, *C.* sp. Paynes Find tends to have smaller flowers.

Calytrix watsonii is also distinguished from *C.* sp. Paynes Find in having broader leaves that are largely glabrous, with rows of cilia along the margins and often along the midrib, longer petioles and longer bracteoles. The latter taxon also tends to be a lower shrub.

Notes. The last two specimens Craven (1987: 86) cited on page 86 for *C. strigosa* were of *C. watsonii,* which he reduced to synonymy. On the same page he noted that the hypanthium was 'mostly shorter (4.5–7 mm long) and fusiform in overall shape' in inland populations and '(5–)7–14 mm long and fusiform for the ovarian region and cylindrical above (rarely obconical to fusiform)' in populations nearer the coast. He decided not to recognise both taxa because he felt that the hypanthium differences were incomplete and because flower colour differences sometimes occurred within species. The shorter hypanthium occurs not only in the yellow-flowered *C. watsonii* but also in the pink- or purple-flowered *C.* sp. Paynes Find. Its fusiform ovarian region is topped by a dilated free portion that does not enclose the style as closely as the more cylindrical free portion in *C. strigosa*.

Northern specimens of *C. watsonii* tend to have larger flowers and bracteoles than southern specimens.

Calytrix sp. **Kennedy Range** (A. Markey & S. Dillon 6301)

Conservation status. Recently listed as Priority Two under DPaW Conservation Codes for Western Australian Flora (Western Australian Herbarium 1998–). This taxon is known from a single collection made in a large national park.

Notes. The recently collected, yellow-flowered specimen *A. Markey & S. Dillon* 6301 (Figures 3, 4) was collected from Kennedy Range, which is north of the range of the pink-flowered members of the *C. strigosa* complex and well north-west of the range of the other yellow-flowered specimens. Now known as *C.* sp. Kennedy Range, it differs from the yellow-flowered *C. watsonii* in its habitat in rock

Figure 4. *Calytrix* sp. Kennedy Range (A. Markey & S. Dillon 6301), images by A. Markey. A – habitat; B – side view of flowering stem; C – top view of flowers.

crevices in sandstone (Figure 4A), and has a somewhat longer hypanthium with a more cylindrical stylar part, which is *c.* 3 mm long. Its leaves are longer and about as thick as wide, with numerous hairs *c.* 0.2–0.4 mm long throughout and with numerous, rather densely packed oil glands.

Being known from only one collection, this taxon is considered too poorly known to describe adequately, but it has been given an informal name as it is distinctive both in its morphology and in its area of occurrence.

Calytrix sp. aff. **watsonii**

Notes. A distinctive specimen (*H. Pringle* 3925) from the Youanmi Station area (Figure 3) is like *C. watsonii* in being yellow-flowered and having high stamen numbers, although its 80 to 90 stamens are even more numerous than in *C. watsonii*. It differs from *C. watsonii* in having leaves that are covered in hairs and sepals that are densely hairy inside in the distal half. *H. Pringle* 3925 was collected close to localities of two pink-flowered specimens of *C.* sp. Paynes Find (*H. Pringle* 3980; *P.G. Wilson* 1244 *& R. Rowe*); it is similar to them in its leaf indumentum, although very different in its stamen numbers. The possibility that it is a hybrid between *C.* sp. Paynes Find and an unidentified parent species of high stamen number cannot be ruled out at this stage. More collections of this taxon are certainly needed to determine its status.

Acknowledgements

The first few years of this study were supported by Australian Biological Resources Study funding. Three of the species named here were originally recognised by others – Sue Patrick, Leigh Sage and Mike Hislop – who established informal names for them. I am also grateful to Cheryl Parker and Malcolm Trudgen for bringing the new species from the Jackson Range area to my attention, Adrienne Markey for images of one of the new taxa, Steve Dillon for assistance with preparation of the distribution maps, and to the staff at MEL for the loan of type material.

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